

PTO 08-2910

CC=WO DATE=20010322 KIND=A1
PN=0120855

ELECTRONIC MAIL SYSTEM, AND COMPUTER READABLE RECORDED MEDIUM ON WHICH
ELECTRONIC MAIL PROGRAM IS RECORDED
[DENSHI MERU SHISUTEMU OYABI DENSHI MERU PUROGURAMU WO KIROKUSHITA
KONPYUTA YOMITORI KANONA KIROKUBAITAI]

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UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. MARCH 2008

Translated by: FLS, Inc.

PUBLICATION COUNTRY (19) : WO

DOCUMENT NUMBER (11) : 01/20855

DOCUMENT KIND (12) : A1

PUBLICATION DATE (43) : 20010322

APPLICATION NUMBER (21) : PCT/JP99/05048

DATE OF FILING (22) : 19990916

ADDITION TO (61) :

INTERNATIONAL CLASSIFICATION (51) : H04L 12/54, 12/58; G06F 13/00

PRIORITY (30) :

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DESIGNATED CONTRACTING STATES (81) : JP, US

TITLE (54) : ELECTRONIC MAIL SYSTEM, AND
COMPUTER READABLE RECORDED MEDIUM
ON WHICH ELECTRONIC MAIL PROGRAM IS
RECORDED

FOREIGN TITLE [54A] : DENSHI MERU SHISUTEMU OYABI DENSHI
MERU PUROGURAMU WO KIROKUSHITA
KONPYUTA YOMITORI KANONA
KIROKUBAITAI

(54) TITLE

ELECTRONIC MAIL SYSTEM, AND COMPUTER READABLE RECORDED MEDIUM ON WHICH ELECTRONIC MAIL PROGRAM IS RECORDED

(57) ABSTRACT

Clients (200A to 200D) are provided with storage units (205A to 205D) for storing information on sent electronic mails, and stop sending a new electronic mail when a text identical to that contained in the new electronic mail is stored in the storage units (205A to 205D). As a result, duplicate sending of an electronic mail containing the identical text is avoided. A mail server (300) judges, when it receives a forwarded electronic mail MAIL_{AB} containing a text and an identifier attached to the text from a client (200B), whether or not the identifier is identical to one of those of the electronic mail received in the past. If this judgment result shows YES, the mail server (300) issues no reception notice to the client (200D) which is the destination of the electronic mail. As a result, the same client (200D) does not receive the same reception notices of electronic mails containing the identical text.

[DETAILED DESCRIPTION OF THE INVENTION]

Electronic mail system, client used in electronic mails, mail server used in electronic mail system, and computer-readable recording media with recorded electronic mail program

[Field of art]

This invention relates to an electronic mail system for sending/receiving electronic mails, a client for an electronic mail system, a mail server for an electronic mail system, computer-readable memory media with a recorded electronic mail program. Especially, this invention relates to an electronic mail system for sending/receiving electronic mails, a client for an electronic mail system, a mail server for an electronic mail system, computer-readable memory media with a recorded electronic mail program that can improve network utilization efficiency, user usability, and mail server memory utilization efficiency.

Lately, with greater popularity of internet and intranets, businesses and individuals are seeing wider use of information transmission via electronic mails. Such information transmission via electronic mails is enabled by electronic mail systems which send electronic mails from sender clients to receiver clients via networks and mail servers. However, electronic mail systems could occasionally send unnecessary e-mails because of user operation mistake or error. In such a case, utilization efficiency of resources such as network and memory can be decreased and

* Numbers in the margins indicate pagination of the foreign text.

the user usability may also suffer. Thus, means and methods which can effectively resolve such problems have been urgently sought up to now.

[Technical background]

Figure 16 shows skeleton framework of a conventional electric mail system. This electronic mail system shown in this drawing is a /2 client-server type communication system which sends e-mails from sender client to receiver client via a mail server.

In this drawing, network 10 represents internet/intranet. This network 10 is connected to clients 20A~20D as its clients, and to a mail server 30 as its server. Client 20A has an e-mail send function which sends e-mails to mail server 30 via the network 10, and also has an e-mail get function which downloads e-mails addressed to itself by referencing the mail server 30 via the network 10.

Here, SMTP (Simple Mail Transfer Protocol) is used as the protocol for enabling the e-mail send function, while POP3 (Post Office Protocol version 3) is used as the protocol for enabling the e-mail get function.

Input section 21A represents a keyboard, mouse, etc. connected to the client 20A which are used to input the header and body comprising the e-mail. The header is made up of the date, addressee, title, carbon copy, blind carbon copy, etc. The display unit 22A represents such devices as CRT (Cathode-Ray Tube) or LCD (Liquid Crystal Display) which displays e-mail creation screen and received mail screen.

Clients 20B ~ 20D have the same configuration as client 20A, which have an e-mail send function and an e-mail get function based on SMTP and

POP3. Further, client 20B is connected to input unit 21B and display unit 22B, while client 20C is connected to input unit 21C and display unit 22C. Similarly, client 20D is connected to input unit 21D and display unit 22D. Each of these clients 20A ~ 20D is assigned a unique address.

The mail server 30 has an e-mail hold function which /3 temporarily holds (deposits) e-mails sent from clients 20A ~ 20D in the memory unit (not shown), a receipt notice function which sends receipt notice to the addressee client of the held e-mail, and an e-mail send function which sends held e-mail to the client. Here, the mail server 30 communicates with the sender client using SMTP, and communicates with the addressee client using POP3.

The behavior of the above-mentioned conventional e-mail system is explained next using the sequence diagram in Figure 17 as a reference. Here, we will explain sending behavior where e-mails are sent from client 20A to clients 20B~20D shown in Figure 16, as well as forwarding behavior where e-mails are forwarded to client 20D.

First, in the sending behavior, the user, client 20A shown in Figure 16, uses the input unit 21A to create e-mails for clients 20B~20D, respectively. In this case, we assume that the same body is used by all of these three created e-mails, while these e-mails differ only in addressees included in the header. Further, the title of these three e-mails is assumed to be "On rules".

When, in step S1 shown in Figure 17, the created three e-mails are sent from client 20A to each of clients 20B~20D, each of these three e-mails

is received by mail server 30 via network 10. With this, the mail server 30 temporarily holds three e-mails in the memory unit (not shown) after recognizing each of the addressees from the respective headers of these three e-mails.

Next, in step S2, the mail server 30 sends out receipt notices to each of addressee clients 20B~20D via the network 10. With this, in step S3, the client 20B accesses the mail server 30 via the network 10 and references the e-mail addressed to itself which has been held in the memory unit of the mail server 30. With this, information about said e-mail is displayed on the display unit 22B of the client 20B. This /4 information includes a mail status indicating whether or not the e-mail has been read, title, sender, etc.

When client 20B requests download, said e-mail is downloaded to client 20B via network 10. With this, said e-mail is displayed on the display unit 22B.

In a similar manner, in step S3, each of clients 20C and 20D downloads said e-mail after referencing said e-mail by accessing mail server 30 via network 10. This means that these three e-mails from client 20A, containing the same body, have been received by each of client 20B~20D in this case.

Next, we will explain the case where each of client 20B and client 20C forwards the e-mail received from client 20A to client 20D. In this forwarding behavior, the user of client 20B creates a forwarding e-mail addressed to client 20D using input unit 21B. In this case, the forwarding e-mail is created using the e-mail received from client 20A. Therefore,

the body of the forwarding e-mail is the same as the body of the previously received e-mail. However, the header of the forwarding e-mail has client 20D as its addressee and "Forward: On rules" as the title of the e-mail. Further, a forwarding e-mail is created in client 20C in the same manner as client 20B.

When, in step S1 shown in Figure 17, each of the created forwarding e-mails are sent from client 20B and client 20C to client 20D, each of these two e-mails is received by mail server 30 via network 10. With this, the mail server 30 temporarily holds two e-mails in the memory unit (not shown) after recognizing each of the addressees (client 20D, in this case) from the respective header of these two e-mails.

Next, in step S2, the mail server 30 sends out receipt notices to addressee client 20D via the network 10. With this, in step S3, the /5 client 20D accesses the mail server 30 via the network 10 and references two e-mails addressed to itself which have been held in the memory unit of the mail server 30. With this, information about said two forwarded e-mails is displayed on the display unit 22D of the client 20D.

When client 20D requests download, said two forwarded e-mails are downloaded to client 20D via network 10. With this, the two forwarded e-mails are displayed on display unit 22D.

With conventional e-mail system, however, problems often occur where duplicate e-mails having the same body are sent to the same addressee by send operation mistake or by user error. In such cases, since unnecessary e-mails are sent, the traffic on network 10 increases proportionately to

the number of clients which send duplicate e-mails. For this reason, a conventional e-mail system used to suffer from decrease in network utilization efficiency.

Further, as was explained with Figure 16 illustration, when e-mails having the same body are sent from client 20A to multiple addressees (clients 20B~20D), it is possible that the addresses client 20B and client 20C could forward the received e-mail to client 20D.

For example, if client 20A sends duplicate e-mails to client 20D, and both client 20B and client 20C should send e-mails having the same body as above to client 20D, client 20D would end up receiving notice from mail server 30 that a total of four e-mails have been received by client 20D.

In this case, the display unit 22D of client 20D would display the screen shown in Figure 18. In Figure 18, "Number" shows a sequence number assigned to received e-mails, while "Mail status" shows whether or not said e-mail has been read. Further, "Mail title" shows titles of /6 said e-mails ("On rules", or "Forward: On rules", for example), while "Sender" is the sender of said e-mail. In this "sender" column, 'A' corresponds to client 20A, 'B' to client 20B, and 'C' to client 20C, respectively.

Further, in Figure 18, each of the e-mails whose "number" is '1' or '2' is sent from client A, while e-mail whose "number" is '3' or '4' has been forwarded, respectively, by client 20B and client 20C.

These four e-mails with a "number" from '1' through '4' have the same

or essentially the same content. Therefore, although it is necessary for user on client 20D to read only one e-mail, the user could end up reading e-mails with the same content many times. This degrades the usability significantly.

Additionally, as explained above, if more than one e-mails with the same content is sent (forwarded) to one same client, the mail server 30 ends up holding multiple number of duplicate e-mail as separate e-mails. Thus, in conventional e-mails system, it was possible for the mail-server 30 to secure unnecessary holding area, degrading the memory utilization badly.

This invention is provided in view of the above situation, and its objective is to provide an e-mail system, a client for an e-mail system, a mail server for an e-mail system, and computer-readable memory media with a recorded e-mail program that can improve network utilization, usability, and mail server memory utilization.

[Disclosure of invention]

This invention, relating to an e-mail system having multiple clients (corresponding to clients 200A~200D in the Embodiment mentioned later) each of whom sends/receives e-mails and having a mail server /7 (corresponding to mail server 300 in the Embodiment mentioned later) which relays the above-mentioned e-mails via network (corresponding to network 100 in the Embodiment mentioned later); wherein the above-mentioned clients have means (corresponding to control units 203A~203D) to create e-mails including the body; have a memory means (corresponding to memory units

205A~205D in the Embodiment mentioned later); and have a control means (corresponding to control units 203A~203D in the Embodiment mentioned later) which cancels sending the new e-mail if the same body included in the new e-mail is stored in the above-mentioned memory means; and wherein the above-mentioned mail server has a decision means (corresponding to control unit 301 in the Embodiment mentioned later) which determines, when it receives an e-mail including a body and an identifier attached to the body from the above-mentioned client, whether or not the said identifier matches any of the identifiers relating to other e-mails received in the past, and has a control means (corresponding to control unit 301 in the Embodiment mentioned later) which sends a receipt notice to the addressee of said e-mail if the result of the above-mentioned decision is a no-match and does not send a receipt notice the addressee of said e-mail if the result of above-mentioned decision is a match.

Under this invention, when a client creates a new e-mail by an e-mail creation means, the control unit judges whether or not the same body included in the new e-mail is already stored in the memory means. If the result of the judgment is a no-match, the new e-mail is sent out. Further, subsequent to sending out this e-mail, if a new e-mail is created which is the same as this e-mail, the control means cancels sending the new e-mail since the body of the e-mail already sent matches the body of the newly created e-mail. In other words, in this case, duplicate transmission of e-mails containing the same body is avoided.

Under this invention, when the mail server receives an e-mail, the

decision means judges whether or not the identifier included in this e-mail matches any identifier relating to an e-mail received in the past. If /8 the judgment result is a no-match, the control means issues a receipt notice to the addressee of this e-mail. On the other hand, if the above judgment result is a match, the control means understands that the same body as the body of this e-mail has already been notified to the client and would not issue a receipt notice to the client.

In this manner, under this invention, the client checks, before sending a new e-mail, whether or not the body included in the new e-mail matches the body included in an e-mail already sent. And, if they match, it cancels sending the new e-mail. This can prevent duplicate transmission of e-mails containing the same body, and improves network usage efficiency.

Further, under this invention, the mail server would not issue a receipt notice to the client when the identifier of the received new e-mail matches the identifier of an e-mail received earlier. Thus, there is no need for the client to reference multiple e-mails containing the same body. This improves user usability.

Under this invention, when a new e-mail is created by an e-mail creation means, the control unit determines whether or not the same body included in the new e-mail is already stored in the memory means. If the result of the judgment by the control unit is a no-match, the new /9 e-mail is sent out. Further, subsequent to sending out this e-mail, if a new e-mail is created which is the same as this e-mail, the control means cancels sending the new e-mail since the body of the e-mail already sent

matches the body of the newly created e-mail. In other words, in this case, duplicate transmission of e-mails containing the same body is avoided.

In this manner, under this invention, judgment is made before sending a new e-mail, whether or not the body included in the new e-mail matches the body included in an e-mail already sent. And, if they match, sending of the new e-mail is canceled. This can prevent duplicate transmission of e-mails containing the same body, and improves network usage efficiency.

Further, this invention relates to clients (corresponding to clients 200A~200D in the Embodiment mentioned later) used by an e-mail system which transmits e-mails via network (corresponding to network 100 in the Embodiment mentioned later); wherein the above-mentioned clients have e-mail creation means (control units 203A~203D in the Embodiment mentioned later) which create e-mails containing bodies; have CRC value calculation means (corresponding to control units 203A~203D in the Embodiment mentioned later) which obtain CRC values of above-mentioned bodies; have memory means (corresponding to memory units 205A~205D in the Embodiment mentioned later) which stores information about previously sent e-mails and above-mentioned CRC values; and have control means (corresponding to control units 203A~203D in the Embodiment mentioned later) which cancel transmission of said new e-mail if CRC value of the body matching the CRC value contained in the new e-mail is stored in above-mentioned memory means and body matching the body contained in the new-email is stored in above-mentioned memory means.

Under this invention, when a new e-mail is created by the e-mail

creation means, the CRC value of the body contained in the new e-mail is calculated by CRC value calculation means. Next, the control means judges whether or not the CRC value matching the CRC value of the body contained in the new e-mail is stored in the memory means. If the result of /10 the judgment is a no-match, the new e-mail is sent out. On the other hand, if the result of the judgment is a match, the control means judges whether or not the body matching the body contained in the new e-mail is stored in the memory means. If the result of the judgment is a no-match, the new e-mail is sent out.

Further, subsequent to sending out the e-mail, if the same e-mail as this e-mail is created, the control means cancels transmission of the new e-mail since the CRC value of the body contained in the new e-mail matches the body contained in previously sent e-mail, and, at the same time, the body of a previously sent e-mail matches the body of newly created e-mail. In other words, in this case, duplicate transmission of e-mails containing the same body is avoided.

Therefore, as explained above, under this invention, a judgment is made, prior to determining whether or not the body contained in the e-mail matches, to determine whether or not the CRC value of the body contained in the e-mail matches. Thus, if the judgment result on CRC value is a no-match, the e-mail can be sent out immediately without having to make a judgment about the body.

Further, this invention relates to a mail server (corresponding to mail server 300 in the Embodiment mentioned later), having multiple clients

each of which sends/receives e-mails, used by an e-mail system which transmits above-mentioned e-mails via network (corresponding to network 100 in the Embodiment mentioned later); wherein the above-mentioned mail server has a judgment means (corresponding to control unit 301 in the Embodiment mentioned later) which determines, when it receives an e-mail containing a body and an identifier attached to said body from above mentioned client, whether or not said identifier matches any identifier related to e-mail received previously; and has a control means (corresponding to control unit 301 in the Embodiment mentioned later) which sends receipt notice to the addressee client of said e-mail if above-mentioned judgment result is a no-match, and, on the other hand, does not send a receipt notice to the addressee client of said e-mail.

Under this invention, when an e-mail is received from a client, the decision means judges whether or not the identifier included in this e-mail matches any identifier relating to any of the e-mails received in the past. If the judgment result is a no-match, the control means issues /11 receipt notice to the addressee client of this e-mail. On the other hand, if the above judgment result is a match, the control means understands that the same body as the body of this e-mail has already been notified to the client and would not issue a receipt notice to the client.

Thus, under this invention, the receipt notice to the client is not issued when the identifier of the received new e-mail matches the identifier of an e-mail received earlier. Thus, there is no need for the client to reference multiple e-mails containing the same body. This improves user

usability.

Further, under this invention, the above-mentioned mail server used by the e-mail system has a memory means (corresponding to memory section 303 in the Embodiment mentioned later) which records information relating only to the e-mails for which a receipt notice was issued by the above-mentioned control means.

Under this invention, the memory means records information relating only to the e-mails for which a receipt notice was issued. To state it alternatively, the memory means does not record unnecessary information about e-mails for which no receipt notice was issued. Thus, under this invention, since the memory means does not record unnecessary e-mails for which no receipt notices were issued, the memory utilization efficiency is improved.

Further, this invention relates to computer-readable recording media with recorded e-mail programs which are used by e-mail systems for transmitting e-mails via a network; wherein the above-mentioned computer-readable recording media records e-mail programs which the computer uses to execute an e-mail creation process which creates an e-mail containing body, a memory process (corresponding to step SA11 in the Embodiment mentioned later) which stores information about e-mails already sent in the memory means, and a control process (corresponding to step SA5 and step SA7 in the Embodiment mentioned later) which cancels transmission of said new e-mail if a body matching the body contained in the new e-mail is stored in the above-mentioned memory means.

Under this invention, when a new e-mail is created by an e-mail creation process, the control process determines whether or not the same body included in the new e-mail is already stored in the memory means. /12 If the result of the judgment by the control process is a no-match, the new e-mail is sent out. Further, subsequent to sending out this e-mail, if a new e-mail is created which is the same as this e-mail, the control process cancels sending the new e-mail since the body of the e-mail already sent matches the body of the newly created e-mail. In other words, in this case, duplicate transmission of e-mails containing the same body is avoided.

In this manner, under this invention, judgment is made before sending new e-mail, whether or not the body included in the new e-mail matches the body included in an e-mail already sent. And, if they match, sending of the new e-mail is canceled. This can prevent duplicate transmission of e-mails containing the same body, and improves network usage efficiency.

Further, this invention relates to computer-readable memory media with an e-mail program for an e-mail system which has multiple clients, each of which sends/receives e-mails and transmits the above-mentioned e-mails via network; wherein the computer-readable memory media records e-mail programs for computers to execute a judgment process (corresponding to step SB3 in the Embodiment mentioned later) which, when an e-mail is received from the above-mentioned client containing a body and an identifier attached to said body, judges whether or not said identifier matches any of the identifiers relating to e-mails received previously;

and also executes a control process (corresponding to step SB8 in the Embodiment mentioned later) which issues a receipt notice to the addressee client of said e-mail if the judgment result of the above-mentioned judgment process is a no-match, and does not issue a receipt notice to the addressee client if the judgment result of the above-mentioned judgment process is a match.

Under this invention, when an e-mail is received from a client, the decision process judges whether or not the identifier included in this e-mail matches any identifier relating to any of the e-mails received in the past. If the judgment result is a no-match, the control process /13 issues a receipt notice to the addressee client of this e-mail. On the other hand, if the above judgment result is a match, the control process understands that the same body as the body of this e-mail has already been notified to the client and would not issue a receipt notice to the client.

Thus, under this invention, a receipt notice to the client is not issued when the identifier of a received new e-mail matches the identifier of an e-mail received earlier. Thus, there is no need for the client to reference multiple e-mails containing the same body. This improves user usability.

[Brief description of the drawings]

Figure 1 is a drawing showing skeleton configuration of one Embodiment relating to this invention. Figure 2 is a block diagram showing the configuration of the same Embodiment. Figure 3 shows resource information in clients 200A~200D shown in Figure 3. Figure 4 is a diagram

showing one example of memory content in memory unit 205A of client 200A shown in Figure 2. Figure 5 shows data structure of e-mails MAIL_B~MAIL_D shown in Figure 1. Figure 6 is a diagram showing one example of memory content in memory unit 205B of client 200B shown in Figure 2. Figure 7 is a diagram showing one example of memory content in memory unit 205C of client 200C shown in Figure 2. Figure 8 shows the data structure of forwarded e-mails MAIL_{AB}~MAIL_{AC} shown in Figure 1. Figure 9 shows resource information in mail server 300 shown in Figure 2. Figure 10 is a diagram showing one example of memory content in memory unit 303 of mail server 300 shown in Figure 2. Figure 11 is a flow chart explaining sending behavior at each of clients 200A~200D. Figure 12 is a flow chart explaining the behavior of the mail server shown in Figure 2. Figure 13 is a flow chart explaining forwarding behavior at each of clients 200A~200D. Figure 14 shows an example screen on display unit 202D of client 200D. Figure 1 /14 is a block diagram showing one example variation of one Embodiment relating to this invention. Figure 16 shows a skeleton configuration of a conventional e-mail system. Figure 17 is a sequence diagram explaining the behavior in a conventional e-mails system. Figure 18 shows one example of a screen on display unit 22D of client 20D.

[The Best Form to Put the Invention in Operation]

The nature of Embodiment of this invention is explained in detail using diagrams. Figure 1 is a drawing showing skeleton configuration of the Embodiment relating to this invention. In this drawing, network 100 represents internet/intranet. This network 100 is connected to clients

200A~200D and mail server 300.

Client 200A has an e-mail send function which sends e-mails to mail server 300 via the network 100, and also has an e-mail get function which downloads e-mails addressed to self by referencing the mail server 300 via the network 100.

This client 200A realizes e-mail send function using the above-mentioned SMTP and realizes e-mail get function using POP3. Further, client 200A is equipped with a duplicate transmission prevention function which prevents duplicate transmission of the same e-mail. The details of this duplicate transmission prevention function are explained later.

Input section 201A represents a keyboard, mouse, etc. connected to the client 200A which are used to input the header and body comprising the e-mail. The header is made up of date, addressee, title, carbon copy, blind carbon copy, etc. The display unit 202A represents devices connected to client 200A such as a CRT (Cathode-Ray Tube) or LCD (Liquid Crystal Display) which displays an e-mail creation screen and received mail screen.

Clients 200B ~ 200D have the same configuration as client 200A, which have e-mail send function and e-mail get function based on SMTP and POP3. /15

Further, client 200B is connected to input section 201B and display unit 202B, and client 200C is connected to input section 201C and display unit 202C. Similarly, client 200D is connected to input section 201D and display unit 202D. Each of these clients 200A ~ 200D is assigned a unique address.

The mail server 300, similar to mail server 30 (see Figure 16), has an e-mail hold function which temporarily holds (deposits) e-mails sent (forwarded) from clients 200A ~ 200D in the memory unit 303 (see Figure 2), a receipt notice function which sends receipt notice to the addressee client of the held e-mail, and an e-mail send function which sends the held e-mail to the client. Here, the mail server 300 communicates with the sender client using SMTP, and communicates with the addressee client using POP3.

Further, mail server 300 has a duplicate receipt notification prevention function which avoids sending a receipt notice about forwarded e-mail which is essentially the same as an e-mail about which the receipt notice has already been sent to the client. The details of this duplicate receipt notification prevention function are explained later.

The configuration of the Embodiment is explained next using Figure 2. Figure 2 assigns the same codes to the parts having corresponding parts in Figure 1. In client 200A shown in Figure 2, control unit 203A is for controlling creation, sending, and receiving of e-mails. The details of the behavior of this control unit 203A will be explained in detail later. Further, the communication unit 204A communicates with mail server 300 using SMTP when sending e-mail, and communicates with mail server 300 using POP3 when downloading e-mail.

The memory unit 205A stores resource information comprising from number of sent mails SC and e-mail configuration information EJ under the control of the control unit 203A. The number of sent mails SC is a

number of e-mails sent from client 200A, and e-mail configuration information EJ is information made up from header information HJ and body BO which comprise the e-mail to be sent.

Header information HJ is made up with e-mail addressee TO, number of pairs PA, identifier ID, CRC value CV and body holding area pointer BP. Identifier ID uniquely identifies body BO. Number of pairs PA is a number of pairs of identifier ID and body BO in an e-mail. For example, in case of a newly created e-mail, the number of pairs PA is "1" since there are one body BO and one identifier ID attached thereto as shown in Figure 4.

In contrast, in the case of a forwarded e-mail created on an e-mail already sent, the number of pairs PA is "2" since in addition to one pair of body and identifier already received, there is the forwarded body and an identifier attached thereto as shown in Figure 6.

CRC (Cyclic Redundancy Check) value CRC shown in Figure 3 is an error detection check code in HDLC (High-level Data Link Control) control procedure, for example. To be more precise, CRC value CV treats the body BO as a binary number data (message polynomial) made from "0" and "1", and it is a remainder obtained by dividing this message polynomial by a prescribed creation polynomial ($X^{16}+X^{12}+X^5+1$, for example). This CRC value CV is 2-byte data.

The body holding area pointer BP is a pointer indicating the holding area of body BO being held in the memory unit 205A. The body BO is a text data showing the content of the e-mail.

Actually, the memory unit 205A stores information shown in Figure 4 which is based on resource information shown in Figure 3. Figure 4 shows number of sent mails SC_A (=3) and e-mail configuration information $EJ_B \sim EJ_D$ corresponding to three e-mails $MAIL_B \sim MAIL_D$ shown in Figure 1, as an example.

Further, the control unit 203A creates e-mails $MAIL_B \sim MAIL_D$ shown in Figure 5 (a)~(c) based on the e-mail configuration information $EJ_B \sim EJ_D$ shown in Figure 4. The details about these e-mails $MAIL_B \sim MAIL_D$ are explained later. Interface unit 206A interfaces among control unit 203A, input unit 201A, and display unit 202A. /17

Clients 200B~200D have the same configuration as the above-mentioned client 200A. In other words, client 200B is comprised with control unit 203B, communication unit 204B, memory unit 205B, and interface unit 206B. Client 200C is comprised with control unit 203C, communication unit 204C, memory unit 205C, and interface unit 206C. Similarly, client 200D is comprised with control unit 203D, communication unit 204D, memory unit 205D, and interface unit 206D.

In mail server 300, control unit 301 controls receiving e-mails, notifying receipt to clients, and downloading e-mails. The details of the behavior of this control unit 301 are explained later. The communication unit 302 communicates among clients 200A~200D using SMTP when receiving e-mails, and communicates among clients 200A~200D using POP3 when downloading e-mails.

Memory unit 303, under the control of control unit 301, stores resource information made from management information K and e-mail

configuration information EJ# shown in Figure 9. The management information K is for managing e-mails, and is made from the number of clients CN, sender address SD, and number of stored mails SM.

Number of clients CN is the total number of clients to be managed by the mail server 300. In the example shown in Figure 2, the number of clients CN is "4" (see Figure 10) since the mail server is managing four clients 200A~200D.

The sender address SD is the address of the (sender) client who has sent the e-mail which the mail server 300 received. Number of stored mails SM is the number of e-mails stored relating to one sender client. The /18 e-mail configuration information EJ# is made up from header information HJ# and body BO# which make up the received e-mail.

Header information HJ# is made up with mail status MS, number of pairs PA#, identifier ID#, CRC value CV#, and body holding area pointer BP#. Mail status MS is information showing whether or not the e-mail stored in the mail server 300 has been downloaded to addressee client, i.e., whether or not the said e-mail was read or not by the user. Number of pairs PA#, identifier ID#, CRC value CV# correspond to number of pairs PA, identifier ID, and CRC value CV shown in above-mentioned Figure 3.

The body holding area pointer BP# is a pointer indicating the holding area of body BO# being held in the memory unit 303. The body BO# is the text data showing the content of the e-mail, and corresponds to body BO shown in above-mentioned Figure 3.

Actually, the memory unit 303 stores information shown in Figure 10

which is based on resource information shown in Figure 9. Figure 10 shows management information K and e-mail configuration information EJ#_B~EJ#_D about three e-mails MAIL_B~MAIL_D shown in Figure 1, as an example.

Next, the behavior of the Embodiment is explained using flow charts shown in Figure 11 ~ Figure 13, respectively. Here, we explain sending behavior which sends one e-mail MAIL_B from client 200A to client 200B, same-information sending behavior which sends three e-mails MAIL_B~MAIL_D from client 200A to clients 200B~200D, and forwarding behavior which sends forwarding e-mails MAIL_{AB} and MAIL_{AC} from client 200B and client 200C to client 200D, shown in Figure 1 and Figure 2.

First, during sending behavior, the user of client 200A shown in Figure 2 inputs information about e-mail MAIL_B addressed to client 200B using input unit 201A. To be more precise, the user inputs "B" for the address of client 200B as the addressee TO shown in Figure 3, and "XXXX rules are as follows..." as the body BO_A shown in Figure 4. /19

In this case, the number of sent mails SC shown in Figure 3 is assumed to be "0". Further, it is assumed that no e-mail configuration information is stored in the memory unit 205A.

In step SA1 shown in Figure 11, the control unit 203A of client 200A shown in Figure 2 attaches A0001, for example, as the identifier to body BO_A shown in Figure 4, and moves on to step SA2. In step SA2, the control unit 203A obtains CRC value relating to the new body BO_A, and moves to step SA3.

To be more precise, the control unit 203A treats the main text BOA as a binary number data (message polynomial) made from "0" and "1", and finds the 2-byte CRC value which is the remainder obtained by dividing this message polynomial by a prescribed creation polynomial ($X^{16}+X^{12}+X^5+1$, for example). In this case, CRC value is assumed to equal "0x7654" (see header information HJ_B in Figure 4).

In step SA3, the control unit 203A reads out number of sent e-mails $SC_A (=0)$ and e-mail configuration information about sent e-mails from the memory unit 205A, and moves to step SA4. In this case, since no e-mail configuration information was stored in the memory unit 205A, the control unit 203A reads out only the number of sent mails $SC_A (=0)$.

In step SA4, the control unit 203A determines whether or not the CRC value contained in the obtained e-mail configuration information matches the new CRC value ($=0x7654$) obtained in step SA2. In this case, since no e-mail configuration information was obtained, the control unit 203 assigns "No" as the judgment result of step SA4, and moves to step SA8.

In step SA8, the control unit 203A decrements by one the number of sent e-mails ($=0$) obtained from the number of sent e-mails SC_A , and moves to step SA9. In this case, the number of sent e-mails would be "-1". /20
The number of sent e-mails is a variable that is used when e-mail configuration information is read from the memory unit 205A.

In step SA9, the control unit 203A checks whether or not the number of sent e-mails is "0" or not. In this case, although the number of sent e-mails is "-1", the control unit 203A assigns "Yes" to the judgment result

of step SA9 as an initial status exception, and moves to step SA11.

If the judgment result of step SA9 is "No", the control unit 203A moves to step SA10, reads e-mail configuration information about the next already-sent e-mail from the memory unit 205A, returns to step SA4, and repeats the above behavior.

In this case, in step SA11, the control unit 203A secures holding area in the memory unit 205A, holds e-mail configuration information EJ_B shown in 4 in this holding area, and moves to step SA12. In this case, the said holding area would have e-mail configuration information EJ_B made up from header information HJ_B and body BO_A.

This header information HJB is made up of the addressee (=B), number of pairs (=1) of identifier and body, identifier (=A0001), CRC value (=0x7654), and body holding area pointer. Here, the number of pairs of identifier and body is "1" since the identifier (=A0001) and body BO_A forms a pair.

In step SA12, the control unit 203A creates e-mail MAIL_B from header H_B and body BO_A shown in Figure 5(a) based on e-mail configuration information EJ_B shown in Figure 4.

In the header H_B of this e-mail MAIL_B, addressee (=B), number of pairs of identifier and body (=1), identifier (=A0001), and CRC value (=0x7654) are information obtained from header information HJ_B shown in Figure 4. Further, the sender address (=A) in the header H_B is the address of client 200A.

When user issues send command, the control unit 203A sends e-mail MAIL_B by controlling communication unit 204A, increments by one the number of sent mails ("0" in this case) shown in Figure 4 to "1" and completes this series of behavior. /21

Further, in step SB1 in Figure 12, the control unit 301 of mail server 300 judges whether or not it has received a request from the client to send an e-mail, that is, whether or not it has received an e-mail. In this case, since the judgment result is "No", it repeats the judgment step.

And, when e-mail MAIL_B (see Figure 5(a)) sent from client 200A is received by communication unit 302 of mail server 300 via network 100, the control unit 301 assigns "Yes" to the judgment result, and moves on to step SB2.

In step SB2, control unit 301 obtains identifier (=A0001) and number of pairs (=1) from header H_B of e-mail MAIL_B shown in Figure 5(a), and moves to step SB3. In step SB3, control unit 301 determines whether or not the identifier (=A0001) relating to e-mail MAIL_B matches any identifier relating to e-mail requested in the past. In this case, the judgment result is given "No", and moves to step SB4.

In step SB4, control unit 301 regards the body BO_A of e-mail MAIL_B as body BO#_B shown in Figure 10 and holds it in memory unit 303, and moves to step SB5. In step SB5, control unit 301 creates header information HJ#_B based on header H_B of e-mail MAIL_B (see Figure 5(a)) and holds it in memory unit 303, and moves to step SB6.

Here, header information HJ#_B shown in Figure 10 is made up of mail

status (=not read), number of pairs of identifier and body (=1), identifier (=A0001), CRC value (=0x7654), and body holding area pointer. This body holding area pointer is a pointer indicating the holding area of the body BO#_B.

In step SB6, control unit 301 decrements by one the number of pairs (=1) obtained from header information HJ#_B, obtaining "0", and moves /22 to step SB7. In step SB7, control unit 301 determines whether or not the number of pairs (=0) is "0" or not. In this case, the control unit 301 assigns "Yes" to the judgment result, and moves to step SB8.

In step SB8, control unit 301 determines if it is necessary to notify receipt to the addressee client of said e-mail. If the judgment result of step SB3 is "Yes", namely if the identifier relating to the e-mail of the send request matches any of the identifiers relating to e-mails of past send requests, the judgment result of step SB8 would become "No".

In this case, since the step SB3 judgment result about e-mail MAIL_B is "No", control unit 301 assigns "Yes" to step SB8 judgment result, and moves to step SB9. In step SB9, control unit 301 sends receipt notice to client 200B which is the addressee of e-mail MAIL_B, and completes this series of processes.

With this, control unit 203B of client 200B accesses mail server 300 via network 100 and references e-mail configuration information EJ#_B (see Figure 10) relating to e-mail MAIL_B addressed to itself which was held in memory unit 303 of mail server 300. With this, information about said e-mail is displayed on the display unit 202B of the client 200B.

And, when a download request is issued by control unit 203B of client 200B, this e-mail MAIL_B is downloaded to client 200B via network 100. With this, e-mail MAIL_B is displayed on display unit 202B.

Next, we will explain the case of duplicate transmission where, subsequent to the above-mentioned e-mail MAIL_B being sent to client 200B, the same e-mail as e-mail MAIL_B ("duplicate e-mail" hereafter) is sent due to a user operation mistake or error. In this case, duplicate e-mail transmission is avoided by the duplicate transmission avoidance function of client 200A.

In this case, with respect to above-mentioned duplicate e-mail, /23 in step SA1 shown in Figure 11, the control unit 203A of client 200A shown in Figure 2 attaches A0002, for example, as the identifier of the body of the duplicate e-mail, and moves on to step SA2. Here, the body of the duplicate e-mail is the same as the body BO_A shown in Figure 4.

In step SA2, the control unit 203A obtains "0x7654" as the CRC value relating to the duplicate e-mail body, and moves to step SA3. In step SA3, the control unit 203A reads out the number of sent e-mails SC_A (=1) and e-mail configuration information EJ_B about sent e-mail MAIL_B from the memory unit 205A, and moves to step SA4.

In step SA4, control unit 203A determines whether or not the CRC value (0x7654) contained in obtained e-mail configuration information EJ_B (see Figure 4) matches the CRC value (=0x7654) in step SA2 relating to the duplicate e-mail. In this case, control unit 203A assigns "Yes" to the step SA4 judgment result, and moves to step SA5.

In step SA5, control unit 203A performs a character-by-character comparison of the body of the duplicate e-mail and body BO_A of e-mail MAIL_B (see Figure 4) to determine whether or not these two bodies match. In this case, control unit 203A assigns "Yes" to the judgment result, and moves to step SA6. In this case, if the step SA5 judgment result is "No", control unit 203A moves to step SA8.

In this case, in step SA6, control unit 203A determines whether or not the addressee (=B) of sent e-mail (e-mail MAIL_B) matches the addressee (=B) of the new send mail. In this case, it assigns "Yes" to the judgment result, and moves to step SA7. In this case, if the step SA6 judgment result is "No", control unit 203A moves to step SA8.

In this case, in step SA7, control unit 203A displays an "already sent" error regarding duplicate e-mail on display unit 202A, and ends this series of processes without sending this duplicate e-mail.

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Next, we will explain the case where client 200A sends the same information to clients 200B~200D as e-mails MAIL_B~MAIL_D. When these e-mails are created at the above-mentioned client 200A, when three addressees clients 200B~200D are specified, the control unit 203A stores each of the e-mail configuration information EJ_B~EJ_D shown in Figure 4 in the memory unit 205A in the same manner as with the above-mentioned e-mail MAIL_B. In this case, e-mail configuration information EJ_B has "B" for addressee, e-mail configuration information EJ_C has "C" for addressee, and e-mail configuration information EJ_D has "D" for addressee.

In each of these e-mail configuration information EJ_B~EJ_D, body and identifier are all body BOA and A0001. Although in the example shown in Figure 4 assigned the same identifier to each of e-mail configuration information EJ_B~EJ_D, it is acceptable to assign different identifiers. Further, the number of pairs and CRC value in each of e-mail configuration information EJ_B~EJ_D are all "1" and "0x7654".

When processing transmission, control unit 203A uses e-mail configuration information EJ_B~EJ_D shown in Figure 4 to create e-mail MAIL_B comprising header H_B and body BO_A, e-mail MAIL_C comprising header H_C and body BO_A, and e-mail MAIL_D comprising header H_D and body BO_A which are shown in Figure 5(a)~(c).

When a user issues a send command, control unit 203A controls communication unit 204A to send e-mails MAIL_B~MAIL_D, and sets "3" as the value of number of sent mails SC_A shown in Figure 4.

When e-mails MAIL_B~MAIL_D (see Figure 5(a)~(c)) sent from client 200A are received by communication unit 302 of mail server 300 via network 100, control unit 301 holds each of e-mail configuration information EJ#_B~EJ#_D shown in Figure 10 in memory unit 303 following the above-mentioned behavior.

Here, e-mail configuration information EJ#_C and EJ#_D are, just /25 like the above-mentioned e-mail configuration information EJ#_B, information corresponding to e-mail MAIL_C (see Figure 5(b)) and to e-mail MAIL_D (see Figure 5(c)). Next, control unit 301 sends receipt notices to clients 200B~200D, the addressees of e-mails MAIL_B~MAIL_D.

With this, each of control units 203B~203D of clients 200B~200D accesses mail server 300 via network 100 and references e-mail configuration information EJ_B~EJ_D (see Figure 10) held in memory unit 303 of mail server 300. With this, the information on each of the e-mails MAIL_B~MAIL_D is displayed on display unit 202B~202D of client 200B~200D, respectively.

Next, we will use the flow chart shown in Figure 13 to explain the case when client 200B and client 200C forward e-mail MAIL_B and MAIL_C received from client 200A as forwarding e-mail MAIL_{AB} (see Figure 8(a)) and MAIL_{AC} (see Figure 8(b)) to client 200D. Client 200A and client 200D will also perform forwarding behavior according to the flow chart shown in Figure 13.

In this forwarding behavior, the user of client 200B creates a forwarding e-mail addressed to client 200D using input unit 201B. In other words, when the user issues a forward command, control unit 203B of client 200B uses received e-mail MAIL_B shown in Figure 5(a) to create e-mail configuration information EJ_{BT} shown in Figure 6, and holds this in memory unit 205B.

In other words, the user of client 200B uses input unit 201B to input information about forwarding e-mail MAIL_{AB} addressed to client 200D. To be more specific, the user inputs addressee "D" for client 200D shown in Figure 6 and forwarding body BO_B shown in Figure 6, respectively. In this case, the number of sent mails SC_B shown in Figure 6 is assumed to be "0". Further, it is assumed that no e-mail configuration information is /26

stored in the memory unit 205B.

In step SC1 shown in Figure 13, the control unit 203B of client 200B shown in Figure 2 attaches B0001, for example, as the identifier to body BO_B shown in Figure 6, and moves on to step SC2. In step SC2, control unit 203B obtains a CRC value relating to forwarding body BO_B shown in Figure 6, and moves to step SC3. In this case, we assume that "0x4567" (see header information HJ_{AB1}) shown in Figure 6 is obtained as the CRC value of forwarding body BO_B.

In step SC3, control unit 203B increments by one the number of sent e-mails SC_B(=0) shown in Figure 6 to assign "1", and moves to step SC4. In step SC4, after updating (or adding) the e-mail configuration information in memory unit 205B, it moves to step SC5.

In this case, control unit 203B adds e-mail configuration information EJ_{BT} shown in Figure 6 to memory unit 205B. This e-mail configuration information EJ_{BT} is made up from header information HJ_{AB1}, forwarding body BO_B, header information HJ_{AB2} and body BO_A. The header information HJ_{AB1} is made up from addresses (=D), the number of pairs of the identifier and body ("1" at this time), the identifier (=B0001) of forwarding body BO_B, the CRC value of forwarding body BO_B, and a body holding area pointer. This body holding area pointer is a pointer indicating the holding area of the forwarding body BO_B.

Further, header information HJ_{AB2} is made up of the identifier (=A0001) of body BO_A contained in header H_B shown in Figure 5(a), the CRC value (=0x7654) of body BO_A, and a body holding area pointer. This body

holding area pointer is a pointer indicating the holding area of the body BO_A.

In step SC5, control unit 203B increments by one the number of pairs of identifier and body ("1" in this case) to obtain "2", and moves to step SC6. In other words, in this case, the number of pairs is "2" since there is a pair of identifier (=B0001) and forwarding body BO_B, and a pair of identifier (=A0001) and body BO_A. In step SC6, control unit 203B holds CRC value (=0x4567) of forwarding body BO_B in the area of CRC value (see /27 header information HJ_{AB1}) shown in Figure 6, and moves to step SC7.

In step SC7, control unit 203B holds the holding area pointer of forwarding body BO_B in the area of the body holding area pointer (see header HJ_{AB1}) shown in Figure 6, and moves to step SC8.

In step SC8, according to e-mail configuration information EJ_{BT} shown in Figure 6, control unit 203B creates a forwarding e-mail MAIL_{AB} made from header H_{AB1}, forwarding body BO_B, header H_{AB2}, and body BO_A shown in Figure 8(a). In the header H_{AB1} of this e-mail MAIL_{AB}, addressee (=D), the number of pairs of identifier and body (=2), the identifier (=B0001), and the CRC value (=0x4567) are information obtained from header information HJ_{AB1} shown in Figure 6.

Further, the sender address (=B) in the header H_{AB1} is the address of client 200B. Further, header H_{AB2} shown in Figure 8(a) corresponds to header information HJ_{AB2} shown in Figure 6.

Here, when the user issues a forward command, control unit 203B controls communication unit 204B to forward the forwarding e-mail MAIL_{AB}.

And, when e-mail MAIL_{AB} (see Figure 8(a)) sent from client 200B is received by communication unit 302 of mail server 300 via network 100, the control unit 301 assigns "Yes" to the step SB1 judgment result shown in Figure 12, and moves on to step SB2.

In step SB2, control unit 301 obtains the identifier (=B0001) and the number of pairs (=2) from header H_{AB1} of forwarding e-mail MAIL_{AB} shown in Figure 8(a), and also obtains the identifier (=A0001) from header H_{AB2}, and moves to step SB3.

In step SB3, control unit 301 determines whether or not the identifier (=B0001) of forwarding body BO_B matches any identifier relating to /28 e-mails whose send request was received in the past. In this case, the judgment result is given "No", and moves to step SB4.

In step SB4, control unit 301 holds forwarding body BO_B of forwarding e-mail MIAL_{AB} (see Figure 8(a)) in the memory unit 303, and moves to step SB5. In step SB5, control unit 301 creates header information based on header H_{AB1} of forwarding e-mail MAIL_{AB} (see Figure 8(a)) and holds it in memory unit 303, and moves to step SB6.

In step SB6, control unit 301 decrements by one the number of pairs (=2), obtaining "1", and moves to step SB7. In step SB7, control unit 301 determines whether or not the number of pairs (=1) is "0" or not. In this case, the control unit 301 assigns "No" to the judgment result, and returns to step SB3.

In step SB3, control unit 301 determines whether or not the identifier of body BO_A (=A0001) matches any of identifiers for which a send request

was received in the past. In this case, since it had received send requests on e-mails $\text{MAIL}_B \sim \text{MAIL}_D$ (see Figure 5(a)~(c)) in the past, the identifier of body B_0_A relating to these e-mails $\text{MAIL}_B \sim \text{MAIL}_D$ is "A0001".

In this case therefore, control unit 301 assigns "Yes" to step SB3 judgment result, and moves to step SB6. In step SB6, control unit 301 decrements by one the number of pairs (=1), obtaining "0", and moves to step SB7. In step SB7, control unit 301 determines whether or not the number of pairs (=0) is "0" or not. In this case, the control unit 301 assigns "Yes" to the judgment result, and moves to step SB8.

In step SB8, control unit 301 determines if it is necessary to notify the addressee client of the receipt of said e-mail. If the judgment result of step SB3 is "Yes", namely if the identifier relating to the e-mail of the send request matches any of the identifiers relating to e-mails of past send requests, the judgment result of step SB8 would become "No".

In this case, since the step SB3 judgment result on forwarding e-mail MAIL_{AB} is "Yes", control unit 301 assigns "No" to step SB8 judgment result, and ends this series of processes without sending a receipt notice to addressee client 200D. /29

Next, we will explain the case when client 200C forwards forwarding mail MAIL_{AC} to client 200D. In this case, the user of client 200C creates a forwarding e-mail addressed to client 200D using input unit 201C. In other words, similar to the above-mentioned forwarding e-mail MAIL_{AB} , when the user issues a forward command, control unit 203C of client 200C creates e-mail configuration information EJ_{CT} shown in Figure 7 based on received

e-mail MAIL_C shown in Figure 5(b), and holds it in memory unit 205C.

In other words, the user of client 200C uses input unit 201C to input information about forwarding e-mail MAIL_{AC} addressed to client 200D. To be more specific, the user inputs addressee "D" for client 200D shown in Figure 7 and forwarding body BO_C shown in Figure 7, respectively. In this case, the number of sent mails SC_C shown in Figure 7 is assumed to be "0". Further, it is assumed that no e-mail configuration information is stored in the memory unit 205C.

In step SC1 shown in Figure 13, the control unit 203C of client 200C shown in Figure 2 attaches C0001, for example, as the identifier to body BO_C shown in Figure 7, and moves on to step SC2. In step SC2, control unit 203C obtains a CRC value relating to forwarding body BO_C shown in Figure 7, and moves to step SC3. In this case, we assume that "0x1234" (see header information HJ_{AC1}) shown in Figure 7 is obtained as the CRC value of forwarding body BO_C.

In step SC3, control unit 203C increments by one the number of sent e-mails SC_C(=0) shown in Figure 7 to assign "1", and moves to step SC4.

In step SC4, after updating (or adding) e-mail configuration information in memory unit 205C, it moves to step SC5. /30

In this case, control unit 203C adds e-mail configuration information EJ_{CT} shown in Figure 7 to memory unit 205C. This e-mail configuration information EJ_{CT} is made up from header information HJ_{AC1}, forwarding body BO_C, header information HJ_{AC2} and body BO_A. The header information HJ_{AC1} is made up from addresses (=D), the number of pairs of identifier and body

("1" at this time), the identifier (=C0001) of forwarding body BO_c, the CRC value of forwarding body BO_c, and a body holding area pointer. This body holding area pointer is a pointer indicating the holding area of the forwarding body BO_c.

Further, header information HJ_{AC2} is made up from the identifier (=A0001) of body BO_A contained in header H_C shown in Figure 5(b), the CRC value (=0x7654) of body BO_A, and a body holding area pointer.

In step SC5, control unit 203C increments by one the number of pairs of identifier and body ("1" in this case) to obtain "2", and moves to step SC6. In other words, in this case, the number of pairs is "2" since there is a pair of identifier (=C0001) and forwarding body BO_c, and a pair of identifier (=A0001) and body BO_A. In step SC6, control unit 203C holds the CRC value (=0x1234) of forwarding body BO_c in the area of the CRC value (see header information HJ_{AC1}) shown in Figure 7, and moves to step SC7.

In step SC7, control unit 203C holds the holding area pointer of forwarding body BO_c in the area of body holding area pointer (see header HJ_{AC1}) shown in Figure 7, and moves to step SC8.

In step SC8, according to e-mail configuration information EJ_{CT} shown in Figure 7, control unit 203C creates forwarding e-mail MAIL_{AC} made from header H_{AC1}, forwarding body BO_c, header H_{AC2}, and body BO_A shown in Figure 8(b). In the header H_{AC1} of this e-mail MAIL_{AC}, addressee (=D), the number of pair of identifier and body (=2), the identifier (=C0001), and the CRC value (=0x1234) are information obtained from header information HJ_{AC1} shown in Figure 7.

Further, the sender address (=C) in the header H_{AC1} is the address of client 200C. Further, header H_{AC2} shown in Figure 8(b) corresponds to header information HJ_{AC2} shown in Figure 7.

Here, when the user issues forward command, control unit 203C controls communication unit 204C to forward the forwarding e-mail $MAIL_{AC}$. And, when e-mail $MAIL_{AC}$ (see Figure 8(b)) sent from client 200C is received by communication unit 302 of mail server 300 via network 100, the control unit 301 assigns "Yes" to the step SB1 judgment result shown in Figure 12, and moves on to step SB2.

In step SB2, control unit 301 obtains the identifier (=C0001) and the number of pairs (=2) from header H_{AC1} of forwarding e-mail $MAIL_{AC}$ shown in Figure 8(b), and also obtains the identifier (=A0001) from header H_{AC2} , and moves to step SB3.

In step SB3, control unit 301 determines whether or not the identifier (=C0001) of forwarding body B_{0c} matches any identifier relating to e-mails whose send request was received in the past. In this case, the judgment result is given "No", and moves to step SB4.

In step SB4, control unit 301 holds forwarding body B_{0c} of forwarding e-mail $MAIL_{AC}$ (see Figure 8(b)) in the memory unit 303, and moves to step SB5. In step SB5, control unit 301 creates header information based on header H_{AC1} of forwarding e-mail $MAIL_{AC}$ (see Figure 8(b)) and holds it in memory unit 303, and moves to step SB6.

In step SB6, control unit 301 decrements by one the number of pairs (=2), obtaining "1", and moves to step SB7. In step SB7, control unit 301

determines whether or not the number of pairs ($=1$) is “0” or not. In this case, the control unit 301 assigns “No” to the judgment result, and returns to step SB3.

In step SB3, control unit 301 determines whether or not the identifier/32 of body BO_A ($=A0001$) matches any of the identifiers for which a send request was received in the past. In this case, since it had received send requests on e-mails $MAIL_B \sim MAIL_D$ (see Figure 5(a)~(c)) in the past, the identifier of body BO_A relating to these e-mails $MAIL_B \sim MAIL_D$ is “A0001”.

In this case, therefore, control unit 301 assigns “Yes” to the step SB3 judgment result, and moves to step SB6. In step SB6, control unit 301 decrements by one the number of pairs ($=1$), obtaining “0”, and moves to step SB7. In step SB7, control unit 301 determines whether or not the number of pairs ($=0$) is “0” or not. In this case, the control unit 301 assigns “Yes” to the judgment result, and moves to step SB8.

In step SB8, control unit 301 determines if it is necessary to notify the addressee client of the receipt of said e-mail. If the judgment result of step SB3 is “Yes”, namely if the identifier relating to the e-mail of a send request matches any of the identifiers relating to e-mails of past send requests, the judgment result of step SB8 would become “No”.

In this case, since the step SB3 judgment result on forwarding e-mail $MAIL_{AC}$ is “Yes”, control unit 301 assigns “No” to the step SB8 judgment result, and ends this series of processes without sending a receipt notice to addressee client 200D.

In this manner, in this Embodiment, even when client 200A tries to

send two copies of the e-mail MAIL_D to client D, only one e-mail MAIL_D is sent to client 200D because of the duplicate transmission avoidance function of client 200A. Further, in this Embodiment, even when client 200B and client 200C forward forwarding e-mails MAIL_{AB} and MAIL_{AC} to client 200D, mail server 300 would not issue a receipt notice to client 200D regarding these forwarding e-mails MAIL_{AB} and MAIL_{AC}.

In this case, the display unit 202D of client 200D displays the /33 screen shown in Figure 14 regarding one e-mail MAIL_D only which should be necessary. In Figure 14, "Number" shows a sequence number assigned to received e-mail MAIL_D from client 200A, while "Mail status" shows whether or not the said e-mail MAIL_D has been read. Further, "Mail title" is the title of said e-mail ("On rules"), while "Sender" is the sender (=A) of said e-mail MAIL_D.

As explained above, under this Embodiment, the clients 200A~200D check, before sending new e-mail, whether or not the body included in the new e-mail matches the body included in an e-mail already sent. And, if they match, it cancels sending the new e-mail. This can prevent duplicate transmission of e-mails containing the same body, and improves network 100 usage efficiency.

Further, under this Embodiment, the mail server 300 would not issue a receipt notice to the addressee clients (client 200A~200D) when the identifier of a received new e-mail matches the identifier of an e-mail received earlier. Thus, there is no need for the clients to reference multiple e-mails containing the same body. This improves user usability.

Further, under this Embodiment, judgment is made by client 200A~200D, prior to determining whether or not the body contained in the e-mail matches, to determine whether or not the CRC value of the body contained in the e-mail matches. Thus, if the judgment result on the CRC value is a no-match, the e-mail can be sent out immediately without having to make a judgment about the body of the e-mail.

Further, under this Embodiment, mail server 300 would not store unnecessary information (body, header information) about e-mails for which no receipt notice was issued. Thus, it can improve the memory utilization efficiency.

Up to this point, we have explained about one Embodiment of this invention. However, the actual configuration examples are not limited /34 to this one Embodiment. Even if the design is modified within the area which does not violate the intent of this invention, such should also be included in this invention. For example, under the above-mentioned Embodiment, it is permissible to store the e-mail program to realize functions of clients 200A~200D and function of mail server 300 in the computer-readable recording media 500 shown in Figure 15, and use computer 400 shown in the same Figure 15 to read and execute this e-mail program recorded in recording media 500 in order to realize functions of clients 200A~200D and mail server 300.

Computer 400 shown in Figure 15 is made up from a CPU401 to execute the above-mentioned e-mail program, an input device 402 such as a keyboard and mouse, ROM (Read Only Memory) 403 which stores various data, RAM (Random

Access Memory) 404 which stores calculation parameters and others, a read device 405 which reads an e-mail program from memory media 500, an output device 406 such as a display and a printer, and various bus BU which connect various device units.

The CPU 401 reads the e-mail program recorded in recording media 500 via read device 405. Then it executes the e-mail program to execute the above-mentioned processes. Memory media 500 not only includes transportable memory media such as an optical disk, floppy disk, and hard disk, but also includes transmission media such as a network which records and stores data temporarily.

As explained above, under this invention, the client checks, before sending new e-mail, whether or not the body included in the new e-mail matches the body included in an e-mail already sent. And, if they match, it cancels sending the new e-mail. This can prevent duplicate transmission of e-mails containing the same body, and improves network usage efficiency.

Further, under this invention, the mail server would not issue a receipt notice to the client when the identifier of the received new e-mail matches the identifier of an e-mail received earlier. Thus, there is /35 no need for the client to reference multiple e-mails containing the same body. This improves user usability.

Further, under this invention, the client checks, before sending new e-mail, whether or not the body included in the new e-mail matches the body included in an e-mail already sent. And, if they match, it cancels sending the new e-mail. This can prevent duplicate transmission of e-mails

containing the same body, and improves network usage efficiency.

Further, under this invention, judgment is made, prior to determining whether or not the body contained in the e-mail matches, to determine whether or not the CRC value of the body contained in the e-mail matches. Thus, if the judgment result on CRC value is a no-match, the e-mail can be sent out immediately without having to make judgment about the main text.

Further, under this invention, since the memory means does not record unnecessary e-mails for which no receipt notices were issued, the memory utilization efficiency is improved.

[Potential Industrial Application]

As explained above, the e-mail system, clients used by the e-mail system, the mail server used by the e-mail system, and the computer-readable recording media with the recorded e-mail program under this invention are useful to communication services that use e-mails as a media since the invention can improve network utilization efficiency, user usability, and memory utilization efficiency of mail server.

1. E-mail system, relating to an e-mail system having multiple clients each of whom sends/receives e-mails and having a mail server which relays the above-mentioned e-mails via network connected to the above-mentioned clients; wherein the above-mentioned clients have means to create e-mails including the body, have a memory means, and have a control means which cancels sending the new e-mail if the same body included in the new e-mail is stored in the above-mentioned memory means; and wherein the above-mentioned mail server has a decision means which determines, when it receives an e-mail including a body and an identifier attached to the body from above-mentioned client, whether or not the said identifier matches any of the identifiers relating to other e-mails received in the past, and has a control means which sends a receipt notice to the addressee of said e-mail if the result of the above-mentioned decision is a no-match and does not send a receipt notice the addressee of said e-mail if the result of the above-mentioned decision is a match.

2. Clients, relating to clients used by an e-mail system which transmits e-mails via a network; wherein the above-mentioned clients have means to create e-mails including the body, have memory means to store information about sent e-mails, and have a control means which cancels sending the new e-mail if the same body included in the new e-mail is stored already in the above-mentioned memory means.

3. Clients used by an e-mail system which transmits e-mails via a network; wherein the above-mentioned clients have an e-mail creation

means which creates e-mails containing bodies, have a CRC value calculation means which obtains CRC values of the above-mentioned bodies, have a memory means which stores information about previously sent e-mails and the above-mentioned CRC values, and have a control means which cancels transmission of said new e-mail if the CRC value of the body matching the CRC value contained in the new e-mail is stored in the above-mentioned memory means and the body matching the body contained in the new e-mail is stored in the above-mentioned memory means.

4. Mail server, having multiple clients each of which sends/receives e-mails, used by an e-mail system which transmits the above-mentioned e-mails via network; wherein the above-mentioned mail server has a judgment means which determines, when it receives an e-mail containing a body and an identifier attached to said body from the above mentioned client, whether or not said identifier matches any identifier related to an e-mail received previously; and has a control means which sends a receipt notice to the addressee client of said e-mail if the above-mentioned judgment result is a no-match, and, on the other hand, does not send a receipt notice to the addressee client of said e-mail.

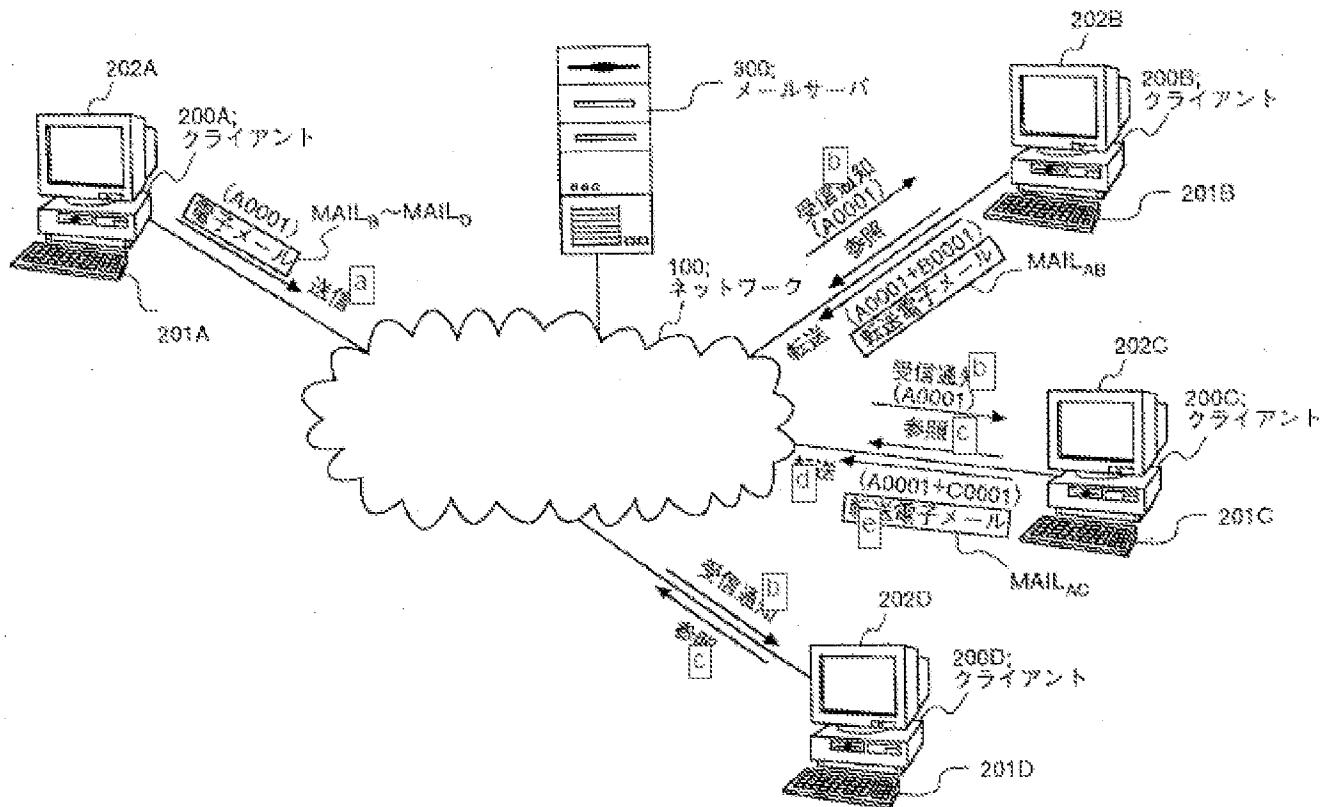
5. Mail server used by e-mail system according to claim 4, wherein the mail server has a memory means which stores information only about e-mails for which the above-mentioned control means issued receipt notices.

6. Computer-readable recording media with recorded e-mail programs which are used by e-mail systems for transmitting e-mails via a network; wherein the above-mentioned computer-readable recording media

records e-mail programs which the computer uses to execute an e-mail creation process which creates an e-mail containing a body, a memory process which stores information about e-mails already sent in the memory means, and a control process which cancels transmission of said new e-mail if a body matching the body contained in the new e-mail is stored in the above-mentioned memory means.

7. Computer-readable memory media with an e-mail program for an e-mail system which has multiple clients each of which sends/receives e-mails and transmits the above-mentioned e-mails via a network; wherein the computer-readable memory media records e-mail programs for computers to execute a judgment process which, when an e-mail is received from the above-mentioned client containing a body and an identifier attached to said body, judges whether or not said identifier matches any of the identifiers relating to e-mails received previously; and also to execute a control process which issues a receipt notice to the addressee client of said e-mail if the judgment result of the above-mentioned judgment process is a no-match, and does not issue a receipt notice to the addressee client if the judgment result of the above-mentioned judgment process is a match.

Figure 1



Key:

200A- Client

MAIL_B~MAIL_D- e-mail

a) Send

300= Mail server

500 Hall set
100= Net work

b) Receipt notice

- b) Receipt in
- c) Reference

c) Reference
300B- Client

200B- Client
d) Forward

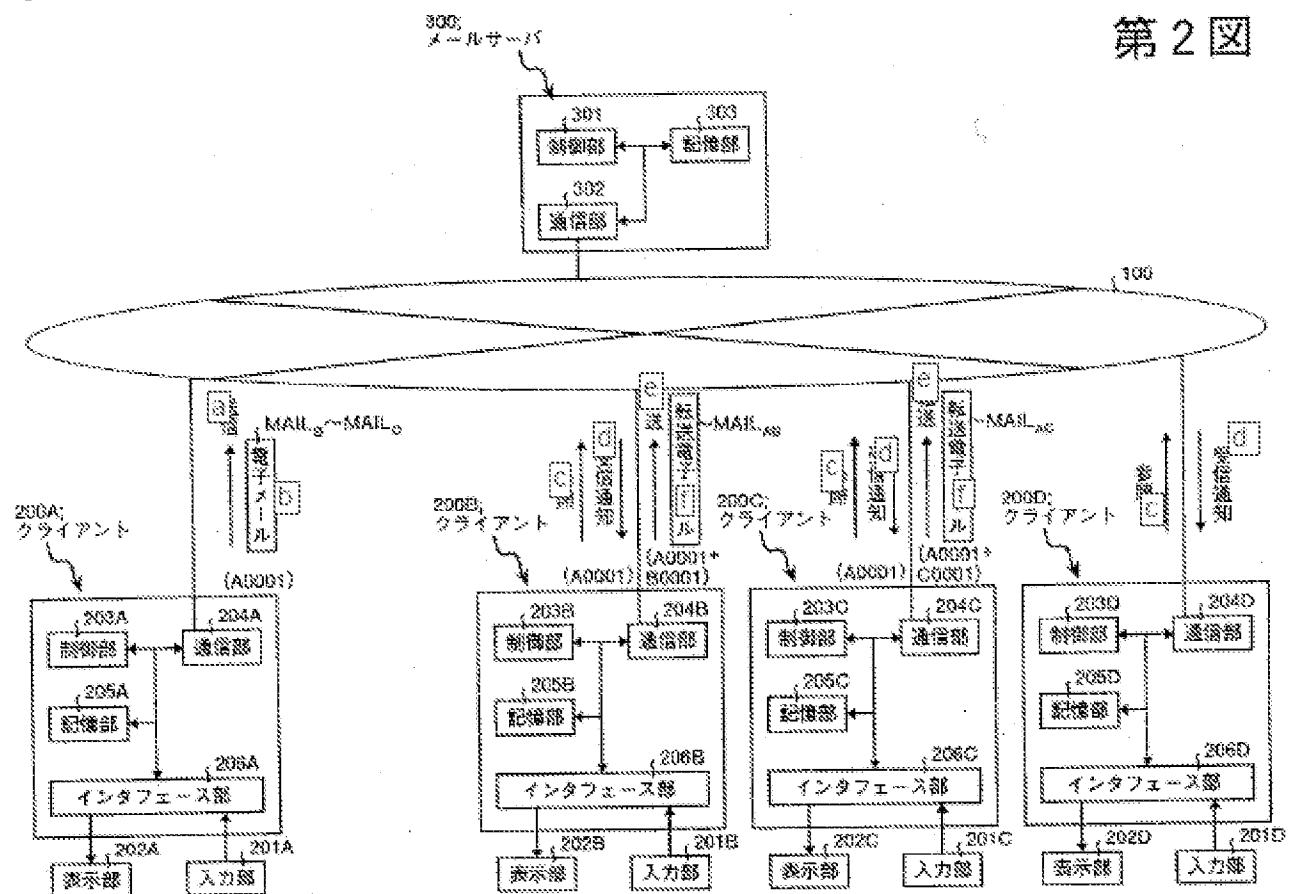
d) Forward

e) Forwarding
200G Client

200C- Client
200D- Client

Figure 2

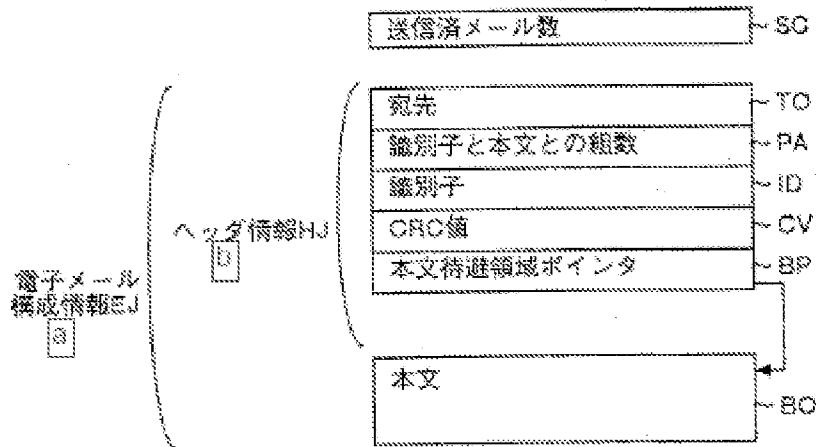
第2図



Key:

300- Mail server; 301- Control unit; 302- Communication unit; 303- Memory unit;
 a) Send; b) e-mail; 200A- Client; 203A- Control unit; 204A- Communication unit;
 205A- Memory unit; 206A- Interface unit; 202A- Display unit;
 201A- Input unit; c) Reference; d) Receipt notice; e) Forward;
 f) Forwarding e-mail; 200B- Client; 203B- Control unit; 204B- Communication unit;
 205B- Memory unit; 206B- Interface unit; 202B- Display unit; 201B- Input unit;
 200C- Client; 203C- Control unit; 204C- Communication unit;
 205C- Memory unit; 206C- Interface unit; 202C- Display unit; 201C- Input unit;
 200D- Client; 203D- Control unit; 204D- Communication unit; 205D- Memory unit;
 206D- Interface unit; 202D- Display unit; 201D- Input unit.

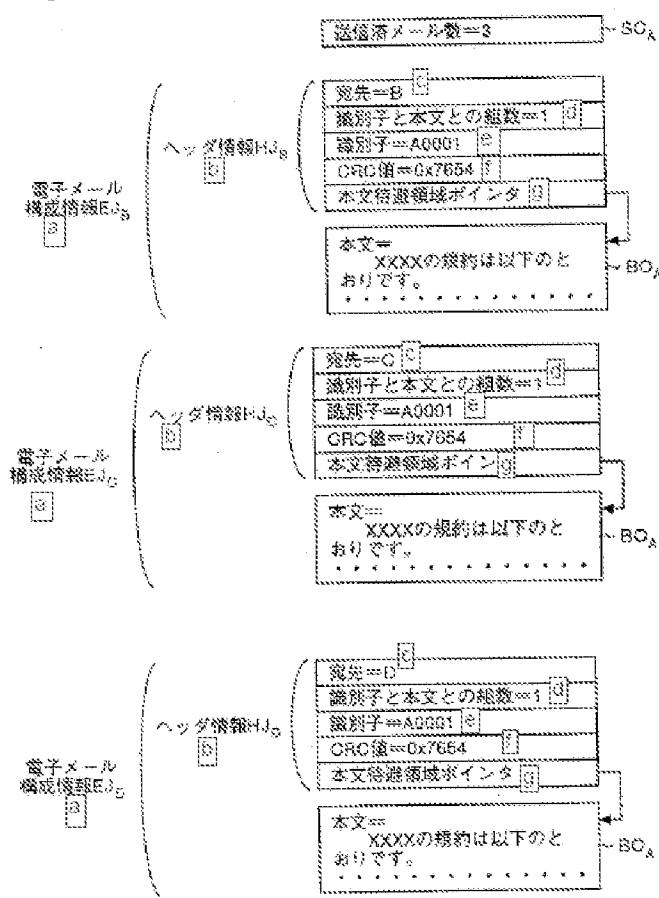
Figure 3



Key:

- a) E-mail configuration information EJ
- b) Header information HJ
- SC- Number of sent e-mails
- TO- Addressee
- PA- Number of pairs of identifier and body
- ID- Identifier
- CV- CRC value
- BP- Body holding area pointer
- BO- Body

Figure 4



- a) E-mail configuration information EJ_B
- b) Header information HJ_B
- c) Addressee = B
- d) Number of pairs of identifier and body = 1
- e) Identifier = A0001
- f) CRC value = 0x7654
- g) Body holding area pointer
- BO_A - Body = "XXXX rules are as follows..."

- a) E-mail configuration information EJ_C
- b) Header information HJ_C
- c) Addressee = C
- d) Number of pairs of identifier and body = 1
- e) Identifier = A0001
- f) CRC value = 0x7654
- g) Body holding area pointer
- BO_A - Body = "XXXX rules are as follows..."

- a) E-mail configuration information EJ_D
- b) Header information HJ_D
- c) Addressee = D
- d) Number of pairs of identifier and body = 1
- e) Identifier = A0001
- f) CRC value = 0x7654
- g) Body holding area pointer
- BO_A - Body = "XXXX rules are as follows..."

Figure 5

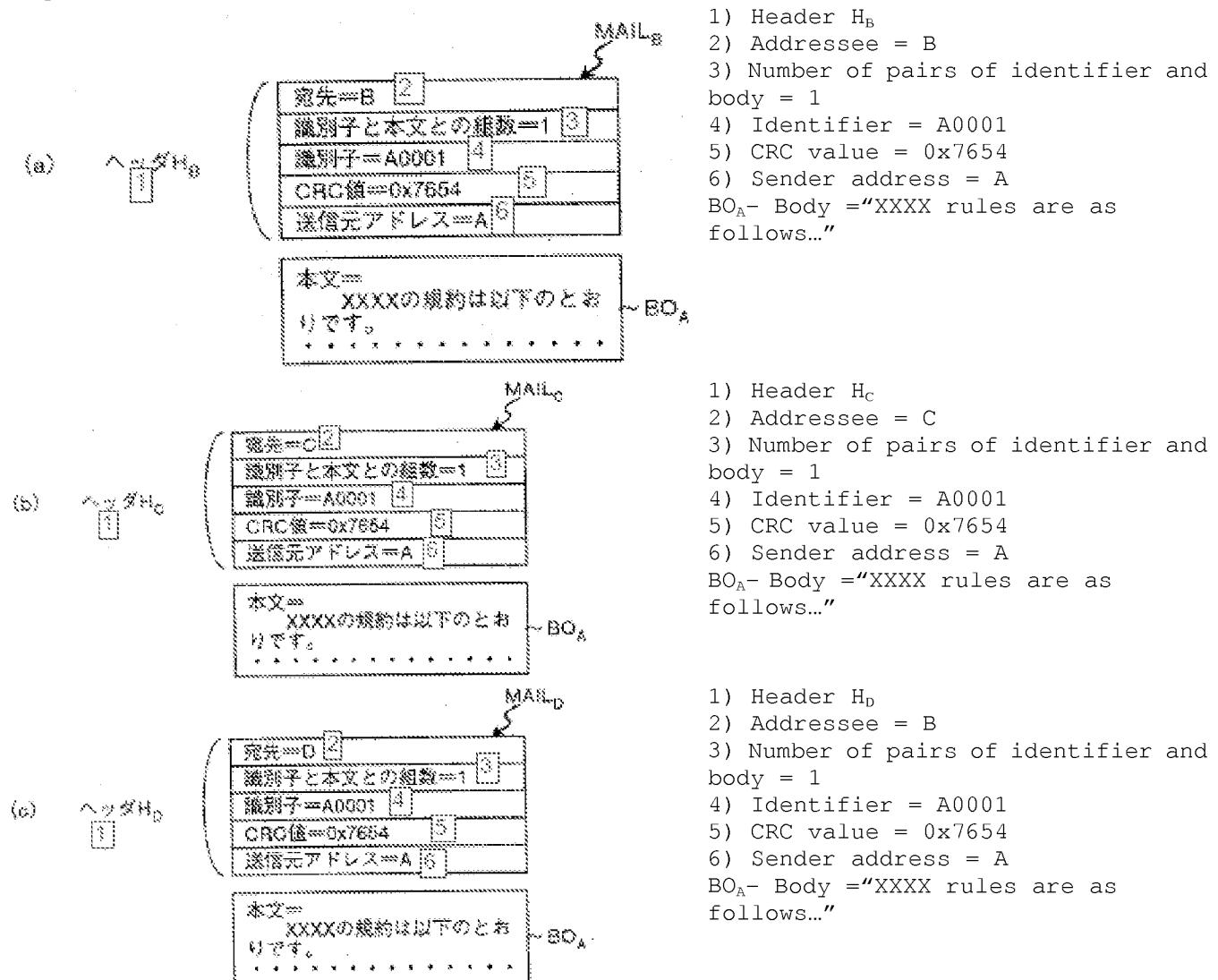


Figure 6

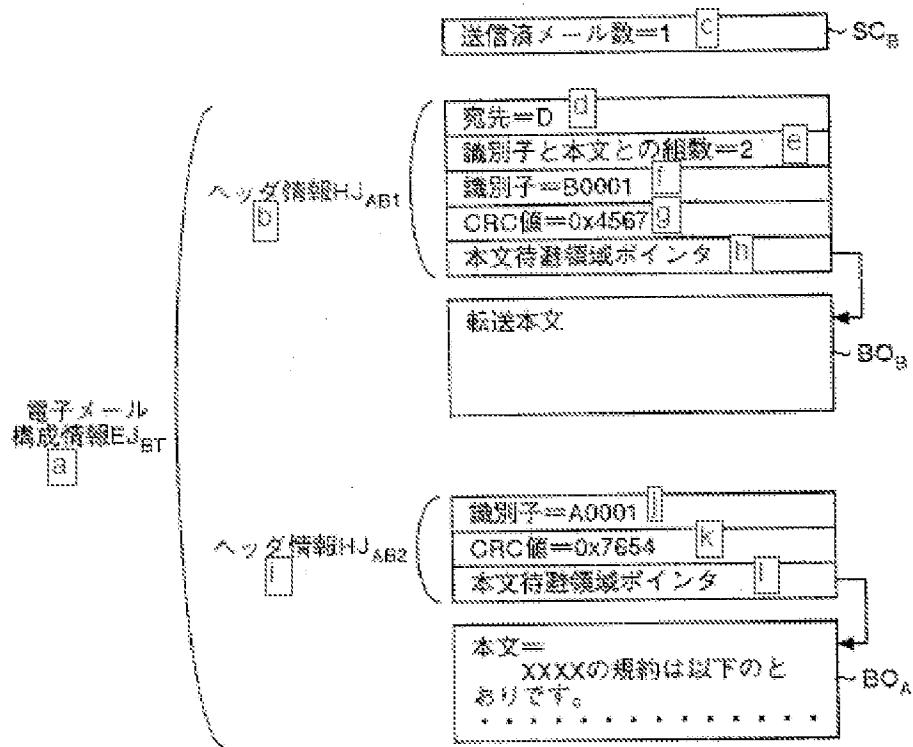


Figure 7

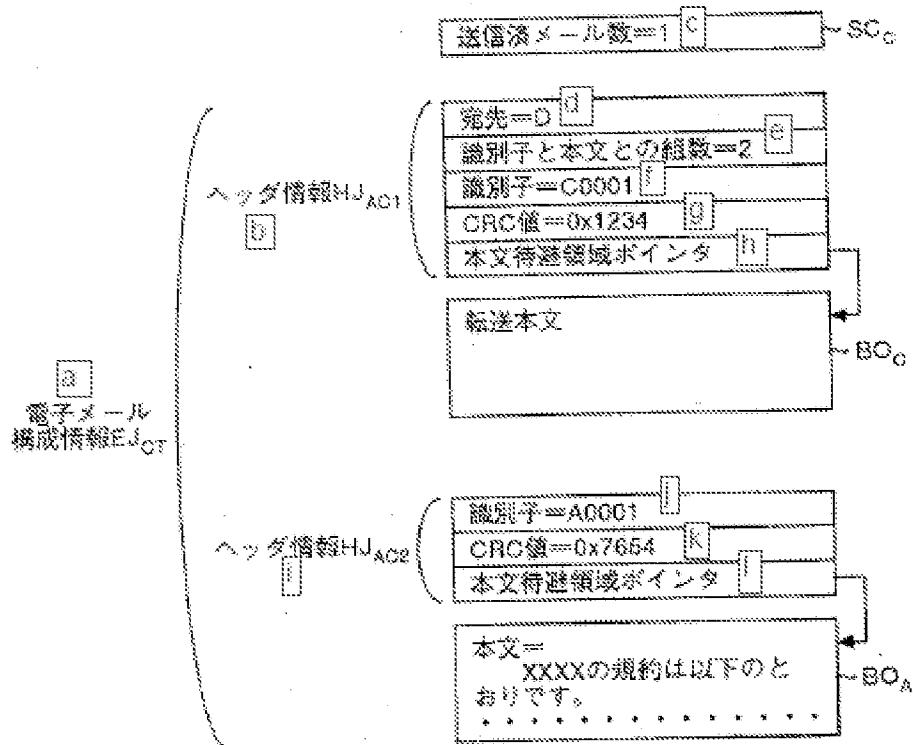
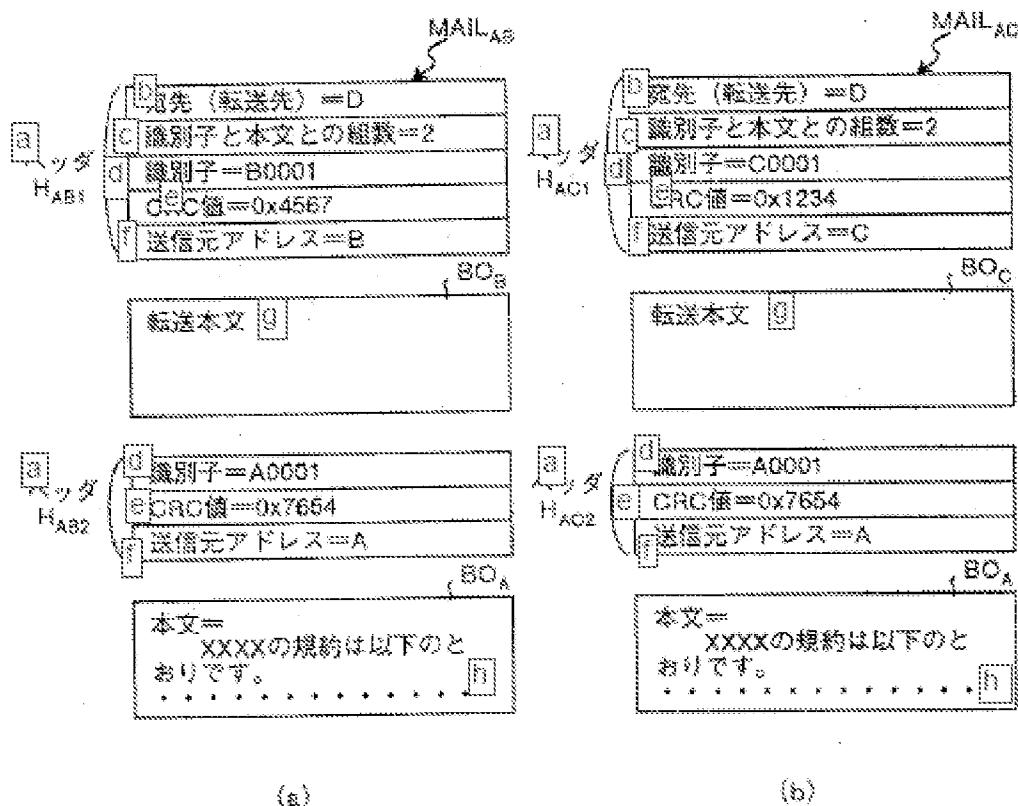


Figure 8



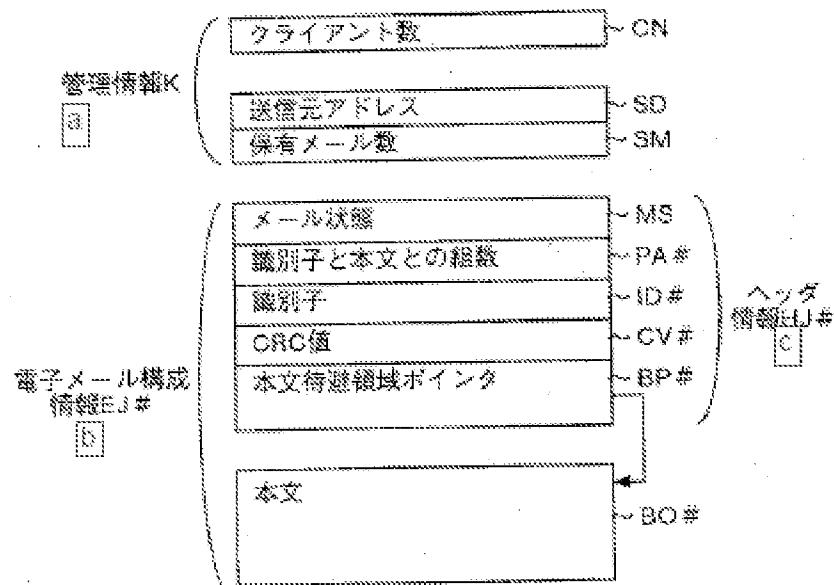
(a)

(b)

Key:

- a) Header
- b) Addressee (Forwarding to) = D
- c) Number of pairs of identifier and body = 2
- d) Identifier =
- e) CRC value =
- f) Sender address =
- g) Forwarding body
- h) Body = "XXXX rules are as follows..."

Figure 9

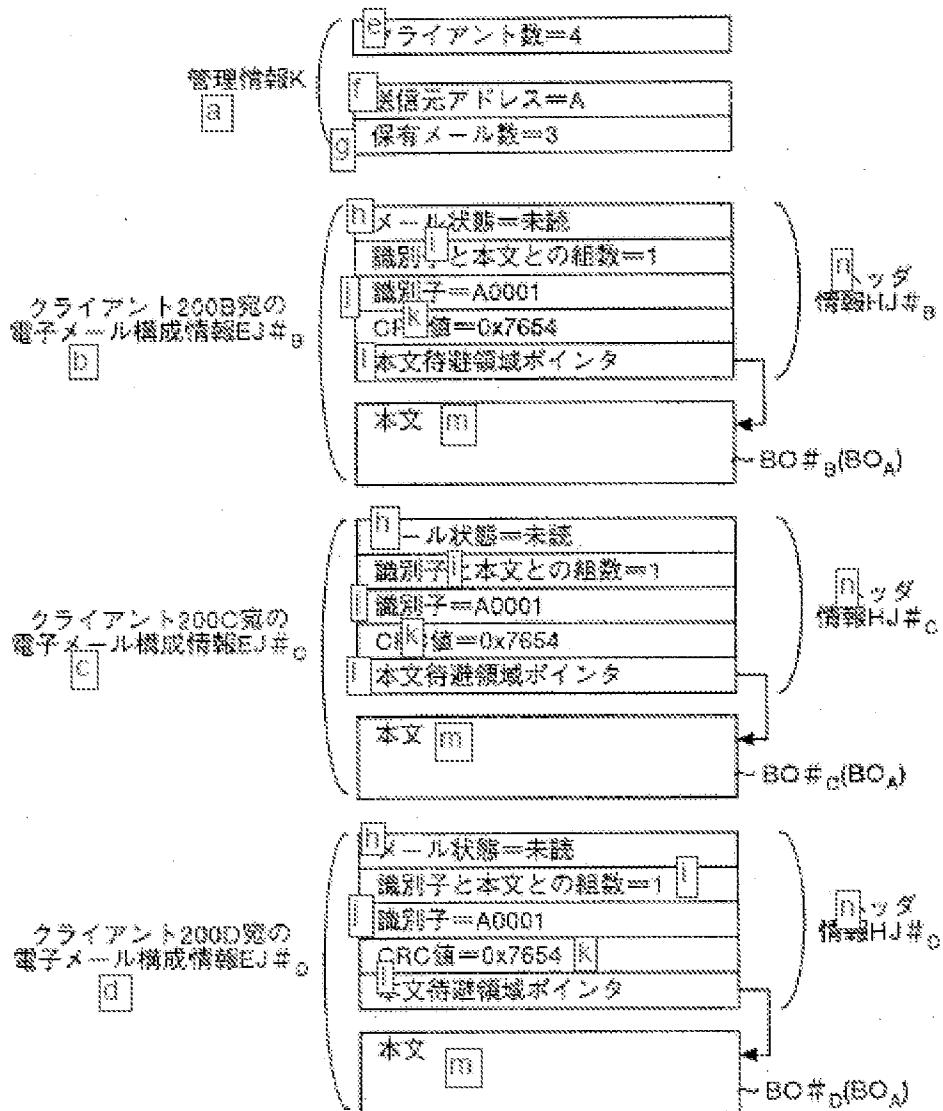


Key:

- a) Management information K
- b) E-mail configuration information EJ#
- c) Header information HJ#

CN- Number of clients
 SD- Sender address
 SM- Number of stored mails
 MS- Mail status
 PA#- Number of pairs of identifier and body
 ID#- Identifier
 CV#- CRC value
 BP#- Body holding area pointer
 BO#- Body

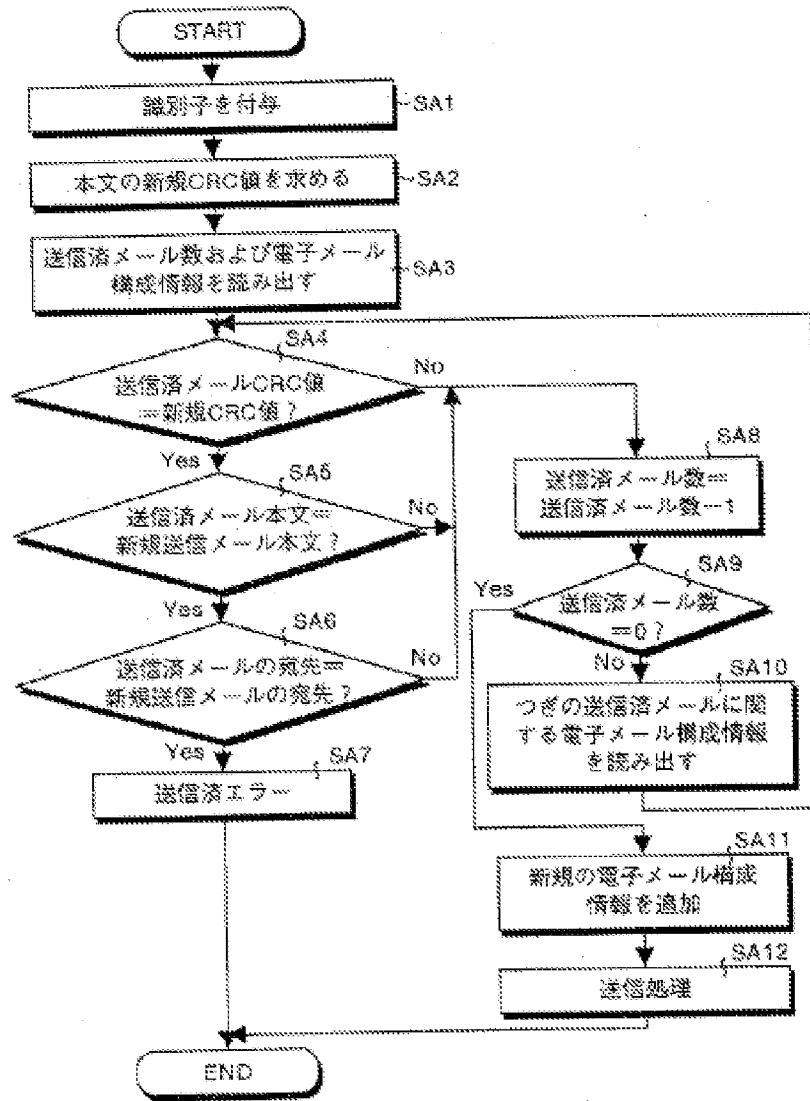
Figure 10



Key for Figure 10:

- a) Management information K
- b) E-mail configuration information $EJ\#_B$ addressed to client 200B
- c) E-mail configuration information $EJ\#_C$ addressed to client 200C
- d) E-mail configuration information $EJ\#_D$ addressed to client 200D
- e) Number of clients = 4
- f) Sender address = A
- g) Number of stored mails = 3
- h) Mail status = Not read
- i) Number of pairs of identifier and body = 1
- j) Identifier = A0001
- k) CRC value = 0x7654
- l) Body holding area pointer
- m) Body
- n) Header information

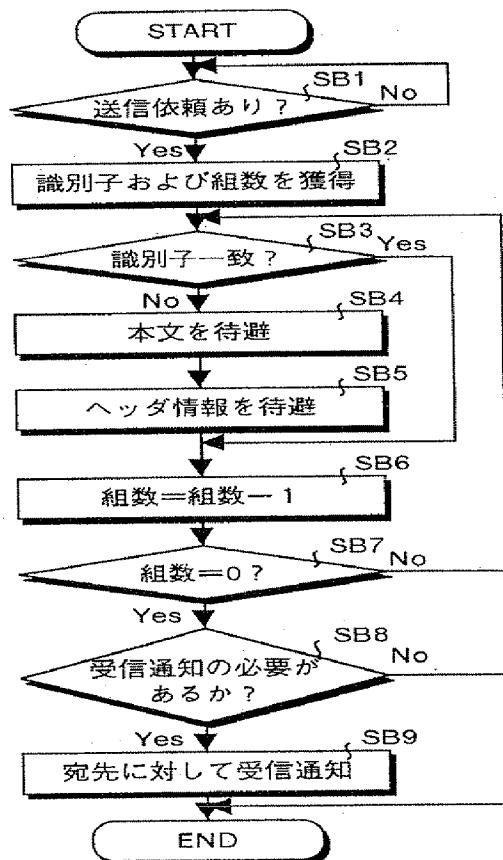
Figure 11



Key:

- SA1- Attach identifier
- SA2- Obtain new CRC value of body
- SA3- Obtain number of sent mails and e-mail configuration information
- SA4- CRC value of sent mail = new CRC value?
- SA5- Body of sent mail = Body of newly sent mail?
- SA6- Addressee of sent mail = Addressee of newly sent mail?
- SA7- Already sent error
- SA8- Number of sent mails = Number of sent mails - 1
- SA9- Number of sent mails = 0?
- SA10- Obtain e-mail configuration information about the next sent mail
- SA11- Add new e-mail configuration information
- SA12- Process send

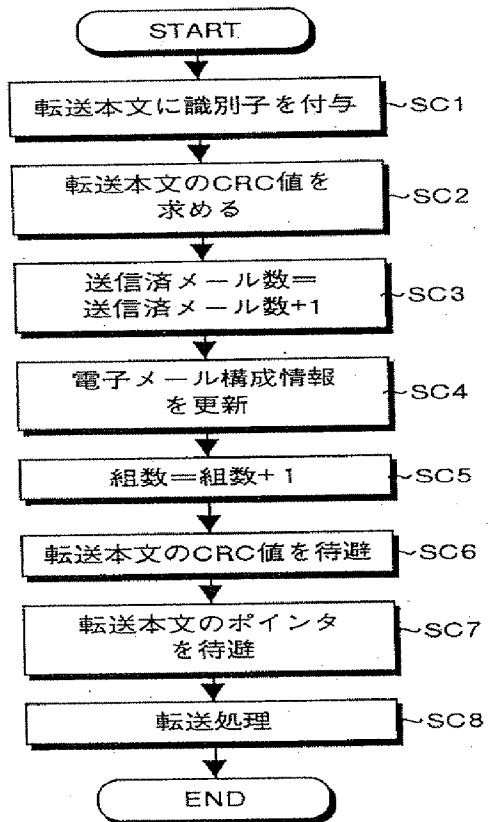
Figure 12



Key:

- SB1- Send request received?
- SB2- Obtain identifier and number of pairs
- SB3- Identifiers match?
- SB4- Hold body
- SB5- Hold header information
- SB6- Number of pairs = Number of pairs - 1
- SB7- Number of pairs = 0?
- SB8- Need receipt notification?
- SB9- Notify receipt to addressee

Figure 13



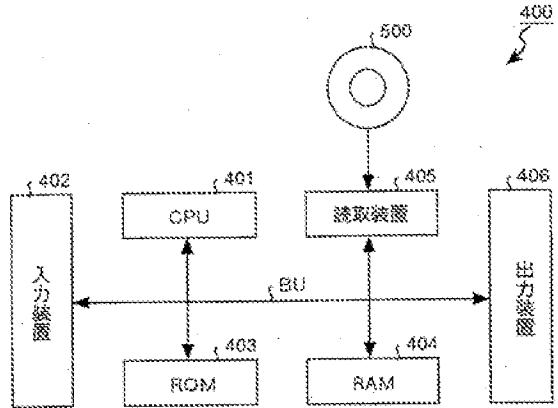
Key:

- SC1- Attach identifier to forwarding body
- SC2- Obtain CRC value of forwarding body
- SC3- Number of sent mails = Number of sent mails + 1
- SC4- Update e-mail configuration information
- SC5- Number of pairs = Number of pairs + 1
- SC6- Hold CRC value of forwarding body
- SC7- Hold pointer of forwarding body
- SC8- Process forwarding

Figure 14

Number	Mail status	Mail title	Sender
1	Not read	On rules	A

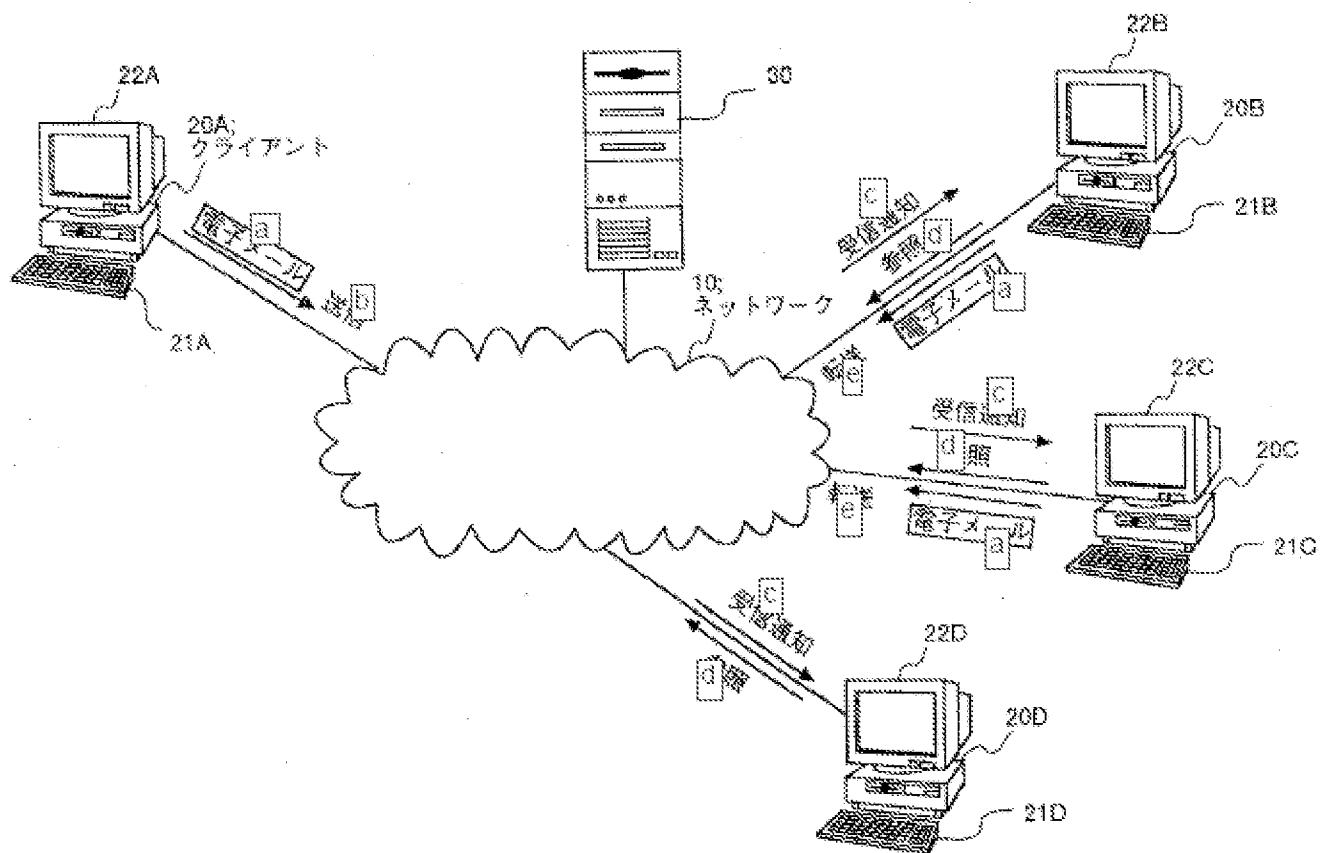
Figure 15



Key:

- 401- CPU
- 402- Input device
- 403- ROM
- 404- RAM
- 405- Read device
- 406- Output device

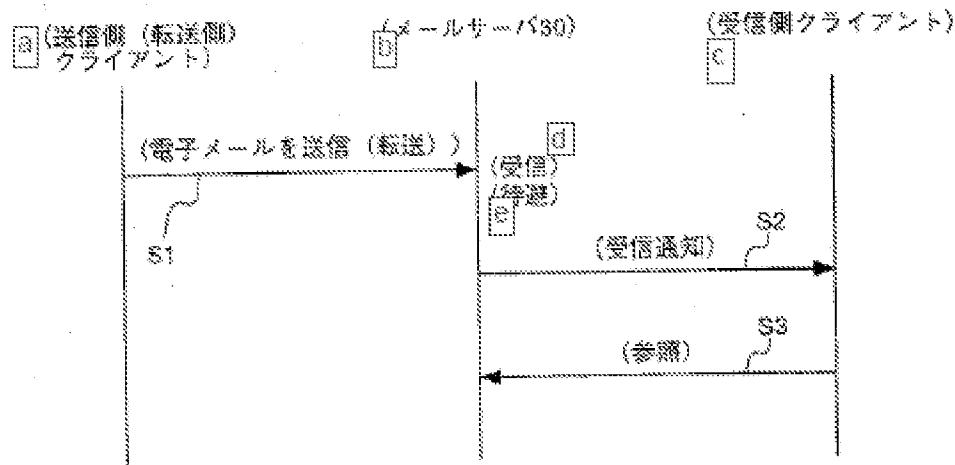
Figure 16



Key:

- 10- Network
- 20A- Client
- a) E-mail
- b) Send
- c) Receipt notice
- d) Reference
- e) Forward

Figure 17



Key:

- a) (Sender side (forwarding side) client)
- b) (Mail server 30)
- c) (Receiver side client)
- S1- (Send (forward) e-mail)
- d) (Receive)
- e) (Hold)
- S2- (Receipt notice)
- S3- (Reference)

Figure 18

Number	Mail status	Mail title	Sender
1	Not read	On rules	A
2	Not read	On rules	A
3	Not read	Forward: On rules	B
4	Not read	Forward: On rules	C

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP99/05048

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl⁶ H04L12/54, H04L12/58, G06F13/00, 351

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl⁶ H04L12/54, H04L12/58, G06F13/00, 351

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 Jitsuyo Shinan Koho (Y1, Y2) 1926-1999 Toseki Jitsuyo Shinan Koho (U) 1994-1999
 Kokai Jitsuyo Shinan Koho (U) 1971-1999 Jitsuyo Shinan Toseki Koho (Y2) 1996-2000

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP, 11-161673, A (Sharp Corporation), 18 June, 1999 (18.06.99), page 3, Column 4, line 50 to page 4, Column 6, line 12 (Family: none)	2, 6
Y	18 June, 1999 (18.06.99), page 3, Column 4, line 50 to page 4, Column 6, line 12 (Family: none)	1
X	JP, 11-232188, A (Fujitsu Limited), 27 August, 1999 (27.08.99), page 4, Column 5, line 13 to page 5, Column 8, line 35 (Family: none)	4-6, 7
Y	27 August, 1999 (27.08.99), page 4, Column 5, line 13 to page 5, Column 8, line 35 (Family: none)	1
A	JP, 6-284145, A (Toshiba Corporation), 07 October, 1994 (07.10.94), page 5, Column 7, line 20 to page 6, Column 10, line 8 (Family: none)	1-7
A	JP, 9-294139, A (Toshiba Corporation), 11 November, 1997 (11.11.97) (Family: none)	1-7
A	JP, 10-232438, A (OMRON CORPORATION), 21 August, 1998 (21.08.98) (Family: none)	1-7

 Further documents are listed in the continuation of Box C. See patent family annex.

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"E"	earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	
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Date of the actual completion of the international search 24 November, 1999 (24.11.99)	Date of mailing of the international search report 07 December, 1999 (07.12.99)
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Form PCT/ISA/210 (second sheet) (July 1992)